REMARKS

The Office Action dated June 2, 2006, has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Claims 1-63 are currently pending in the application, of which claims 1-3, 25, 32, 44, 51, and 63 are independent claims. Claims 1-62 have been amended, and claim 63 has been added, to more particularly point out and distinctly claim the invention. No new matter has been added. Claims 1-63 are respectfully submitted for consideration.

Claims 1-62 were again rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,735,182 of Nishimori et al. ("Nishimori") in view of U.S. Patent No. 5,784,031 of Weiss et al. ("Weiss"). The Office Action took the position that Nishimori teaches all of the elements of independent claims 1-3, 25, 32, 44, 51, and (by inference) new claim 63 except "disconnecting at least one antenna branch." The Office Action supplied Weiss to remedy the deficiencies of Nishimori. Applicant respectfully traverses this rejection.

Claim 1, upon which claims 5-24 depend, is directed to a method of compensating for a radiation pattern in a radio system. The method includes forming a primary radiation pattern by weighting signals of at least two functional antenna branches of a base station. The method also includes disconnecting at least one antenna branch. The method additionally includes forming a radiation pattern that compensates for the primary radiation pattern by weighting signals of the functional antenna branches.

Claim 2, upon which claims 4-12 depend, is directed to a method of weighting signals in a radio system. The method includes weighting signals of at least two functional antenna branches of a base station with primary weights to form a primary radiation pattern. The method also includes disconnecting at least one antenna branch. The method further includes weighting signals of the functional antenna branches with weights that compensate for the primary weights to form a compensating radiation pattern.

Claim 3 is directed to a method of weighting signals in a radio system. The method includes weighting signals of at least two functional antenna branches of a base station with primary weights to form a primary radiation pattern. The method also includes disconnecting at least one antenna branch. The method further includes weighting signals of the functional antenna branches with previously known weights that compensate for the primary weights to form a compensating radiation pattern.

Claim 25, upon which claims 26-31 and 33-43 depend, is directed to a radio system including a base station configured to form a radio interface of the radio system. The base station includes at least two antenna branches for establishing a radio link to terminals. Each antenna branch includes at least one antenna element configured to form an antenna array. The base station includes weighting means for weighting signals of the functional antenna branches configured to form a primary radiation pattern. The base station is configured to disconnect at least one antenna branch. The weighting means are

configured to weight signals of the functional antenna branches to form a radiation pattern that compensates for the primary radiation pattern.

Claim 32 is directed to a radio system including a base station configured to form a radio interface of the radio system. The base station includes at least two antenna branches for establishing a radio link to terminals. Each antenna branch includes at least one antenna element configured to form an antenna array. The base station includes weighting means for weighting signals of the functional antenna branches configured to form a primary radiation pattern. The base station is configured to disconnect at least one antenna branch. The weighting means is configured to weight signals of the functional antenna branches with previously known weights to form a radiation pattern that compensates for the primary radiation pattern.

Claim 44, upon which claims 45-50 and 52-62 depend, is directed to a base station of a radio system includes at least two antenna branches for establishing a radio link to terminals, each antenna branch comprising at least one antenna element for forming an antenna array. The base station also includes weighting means for weighting signals of the functional antenna branches to form a primary radiation pattern. The base station is configured to disconnect at least one antenna branch. The weighting means are configured to weight signals of the functional antenna branches to form a radiation pattern that compensates for the primary radiation pattern.

Claim 51 is directed to a base station of a radio system. The base station includes at least two antenna branches for establishing a radio link to terminals, each antenna

branch comprising at least one antenna element for forming an antenna array. The base station also includes weighting means for weighting signals of the functional antenna branches to form a primary radiation pattern. The base station is configured to disconnect at least one antenna branch. The weighting means is configured to weight signals of the functional antenna branches with previously known weights to form the compensating radiation pattern.

New claim 63 is directed to a method of compensating for a radiation pattern in a radio system. The method includes forming a primary radiation pattern by weighting signals of at least two functional antenna branches of a base station. The method also includes disconnecting at least one antenna branch. The method additionally includes forming a radiation pattern that compensates for the primary radiation pattern by weighting signals of the functional antenna branches with previously known weights.

Certain embodiments of the present invention relate to a technique for compensation of a radiation pattern in a radio system. The compensation is obtained by preliminarily forming a primary radiation pattern by weighting signals of at least two functional antenna branches of a base station. Then, at least one antenna branch is disconnected and a radiation pattern is formed which compensates for the primary radiation pattern by weighting signals of the functional antenna branches.

Thus, such embodiments of the present invention can advantageously solve a problem related to interference directed at antenna branches and caused, for example, by

supply electronics, as explained in more detail in the "BACKGROUND" section of the present application.

Applicant respectfully submits that the combination of Nishimori and Weiss does not disclose or suggest all of the elements of any of the presently pending claims, and thus cannot provide that above-described critical and unobvious advantages.

The Office Action, in the "Response to Arguments" section fails to address these critical and unobvious differences (which were previously brought to the attention of the USPTO) between the cited references and the present application. Accordingly, Applicant respectfully submits that the critical and unobvious distinctions provide a basis for rebutting the Office Action's case for obviousness of the claims. Furthermore, because the critical and unobvious differences are not addressed by the Office Action, there is no basis for maintaining the rejection, and it is respectfully requested that the rejection be withdrawn.

Nishimori generally relates to an adaptive array antenna system. Nishimori's adaptive array antenna system aims to calibrate, automatically, both amplitude and phase of each array antenna element during communication, as explained at column 1, lines 5-11. As can be seen from Figure 13 and at column 1, lines 48-53, Nishimori's system includes antenna elements 13-1-1 to 13-1-N, each coupled with transmitters 13-1-1 to 13-1-N or receivers 13-4-1 to 13-4-N through transmit/receive switches 13-2-1 to 13-2-N.

Nishimori, thus, describes a calibration system. However, Nishimori fails to relate the calibration system to compensation of a radiation pattern. Therefore, a person of

ordinary skill in the art would not have used teaching of Nishimori in order to solve the problem discussed above. If one of ordinary skill in the art used the teachings of Nishimori, the result would still be restricted to a calibration of an antenna array, not to compensation of a radiation pattern.

The Office Action, in the Response to Arguments section, replied that Nishimori does disclose that "the calibration on [sic] transceiver ... can be compensated [sic] of [sic] a radiation pattern." The Office Action cited column 15, and column 16, "lines 39-7 [sic]."

The cited portion of Nishimori in column 16 simply indicates that radiation pattern control calculation circuit (2-10) can control a radiation pattern by applying weighting signals. Furthermore, in column 15, Nishimori does mention compensation and compensation for: amplitude error, phase error, and temperature characteristics. Nishimori also mentions calibration values. However, Nishimori does not relate the calibration values to the compensation for the various error sources. Instead, as noted above, Nishimori compensates for those various error sources through the use of multiplier circuit 9-11, as can be seen from column 15, lines 41-55.

The Office Action also cited Figures 2 and 6 (and their corresponding description). However, these figures again do not relate the calibration to the compensation, despite the Office Action's comments which, while difficult to understand, appear to be to the contrary.

The Office Action further responded that "the same functionality" is disclosed by Nishimori, and cited Figures 2, 6, and "page [sic] 8" lines1-30. Page 8 of Nishimori is Figure 7 and Applicant is, therefore unable to determine what the Office Action was intending to cite. However, Nishimori dose not describe the same functionality as the claims of the present invention, even if some of the hardware used is similar hardware to the hardware used in Nishimori (which, as best understood, is the Office Action's position).

As previously explained to the USPTO, the problem cited by Nishimori is the interference from adjacent cell, as can be seen at column 1, lines 28 and 29 of Nishimori. The problem is solved by calibrating an antenna array. Therefore, one of ordinary skill in the art would not have taken Nishimori as an information source for solving the problem described above. Nishimori cannot be interpreted, either alone or combined with Weiss, as disclosing or suggesting the elements of the presently pending claims. Thus, Nishimori cannot provide the above-described critical and unobvious advantages.

As explained at column 1, lines 54-65 of Nishimori, a receive signal is applied to a receiver through an antenna element and a transmit/receive switch. An output of the receiver is applied to a radiation pattern control calculation circuit 13-7 that calculates amplitude and phase of each channel. A weight multiplier circuit 13-6 multiplies the amplitude and phase to a signal to be transmitted, and the product of the multiplication is applied to antenna elements through transmitters and transmit/receive switches. The

amplitude and the phase of the antenna elements are controlled by the weight multiplier circuit so that a desired shape of an antenna beam is obtained.

Further, as can be seen at Figure 12 and column 2, line 64, to column 3, line 13, of Nishimori, the system comprises a reference signal generator 12-11 that sends a signal, which is common to all the branches, to receiver 12-3 through a separator 12-14a. An adjusted value for each receiver is determined based upon a value received in each receiver and a reference value that is a received value by a specific receiver. A transmitter 12-4 sends a signal to a receiver through a switch 12-13 and an attenuator 12-12. The adjusted value is obtained by an output of each receiver, and a reference value of a reference receiver that is defined in the process. Thus, the amplitude and phase of each branch of an antenna array can be adjusted by using only a communication apparatus, according to Nishimori.

However, as the Office Action correctly observed, Nishimori fails to disclose or suggest "disconnecting at least one antenna branch" (as recited by claim 1) and "wherein the base station is arranged to disconnect at least one antenna branch" (as recited by claims 25 and 44). In order to remedy these deficiencies, the Office Action supplied Weiss. Weiss, however, does not remedy these deficiencies.

Weiss generally relates to versatile antenna array for multiple pencil beams and allegedly efficient beam combinations. Weiss, as explained at column 2, lines 9-24, generally discloses a base station including an antenna array that can be used to generate multiple well separated pencil radiation beams. Alternatively, as explained at column 2,

lines 25-36, these beams can be combined, without a significant loss, to create a wide angle beam, because non-orthogonal beams may be combined without significant field cancellation. The result is a single antenna array that can be used to transmit or receive different information on different beams at the same frequency or, alternatively, it can be used for transmitting exactly the same information on all beams or on several beams that cover a sector, as explained at column 2, lines 1-8.

As can be seen from Figures 3A, 3B and 4 as well as column 4, line 29 to column 4, line 43 of Weiss, a beam-forming network 308 has 32 inputs 402 and 32 outputs 404. Each output 404 corresponds to an antenna element 202. Each input corresponds to the signal for a beam of a particular multi-element antenna array 108. An example of this can be seen in Figure 1B. The beams closest to the center of the 120 degree radiation pattern sector developed by a particular multi-element antenna array have their inputs labeled "L1" and "R1," respectively.

Weiss indicates, at column 5, lines 15-27 that, preferably, the inputs for beams "L15," "L16," "R15," and "R16" are left disconnected since these outermost beams would be attenuated. However, Weiss is silent as to disconnecting any antenna branches.

In Weiss, inputs for beams "L15", "L16", "R15", and "R16" are left disconnected since these outermost beams would be attenuated. Moreover, Weiss fails to disclose the primary radiation pattern be compensated by weighting signals of the functional antenna branches. In Weiss, the non-connection of the inputs for the specific beams is aimed at reducing the attenuation of the outermost beams. Indeed, the problem cited by Weiss is

to segregate groups of user stations in the spatial domain. The problem is solved by applying 180 degree phase shift for every other beam in a radiation pattern, as explained at column 8, lines 36-52 of Weiss. In certain embodiments of the present invention, in contrast, the disconnected antenna branches can be selected on a random basis based, for example on the interference in the supply electronics of the antenna branches, which interference is not thought to be a deterministic occurrence. As a result, the solution of Weiss would not solve the problem cited in the present application and, thus, cannot achieve the above-identified critical and unobvious advantages. Instead, Weiss would aggravate the situation, since the antenna capacity would not fully be used.

If one of ordinary skill in the art were to combine Nishimori and Weiss (not admitted), the result would be a calibration system that utilized a beam-forming array of Weiss with specific unconnected antenna signals. The combination would, thus, be different from that defined by the claims of the present application, because there is no intentional compensation of the radiation pattern that was obtained before a disconnection of any specific antenna signals.

Indeed, Weiss does not specifically teach "disconnecting" at least one antenna branch, but only that the inputs for several particular beams are "left disconnected." Leaving something disconnected is different from disconnecting something. That this is a significant difference becomes clear when "compensating" is properly understood. If a primary radiation pattern is to be compensated for after the disconnection of at least one antenna branch, that branch cannot simply be "left disconnected" there must actually be

"disconnecting" that occurs. Accordingly, it is respectfully submitted that Weiss does not and cannot remedy the deficiencies of Nishimori by teaching "disconnecting at least one antenna branch" (as recited by claim 1) and "wherein the base station is arranged to disconnect at least one antenna branch" (as recited by claims 25 and 44).

The Office Action, in the Response to Arguments section, replied that "Weiss specifically disclose [sic] one input (one antenna branch) are [sic] disconnected by multi element antenna array (Please see detail in col. 4 through col. 5, lines 13-62) and applicant's specification on page 14." Applicant respectfully disagrees with the Office Action's position, as best understood.

In fact, the cited portion confirms exactly what Applicant already asserted, namely that in Weiss, the branches are not "disconnected" (as claimed) but are "left disconnected" column 5, lines 22-24. It appears that the Office Action has simply overlooked the clear statement by Weiss that the inputs are "left disconnected" or has not acknowledged the difference between leaving antenna branch disconnected (i.e. leaving an unconnected branch in an unconnected state), and disconnecting a branch (i.e. moving a branch from a connected to state an unconnected state). It is respectfully submitted that the Office Action's explanation of Weiss constitutes clear error, because Weiss does not teach "disconnecting" but rather that inputs for certain beams are "left disconnected" as clearly stated at column 5, lines 22-24 of Weiss. It is, therefore, respectfully requested that the rejection of claims 1-3, 25, 32, 44, 51, and 63 be withdrawn.

Furthermore, claims 3, 32, 51, and 63 recite that "weighting signals of the functional antenna branches with previously known weights" as part of the compensation. Applicant respectfully submits that the combination of Nishimori and Weiss also fails to disclose or suggest at least this feature of the claims.

Nishimori, for example, discloses instead a calibration procedure, in which the weights are calculated according to a calibration result, which depends on the current environment (such as temperature variation during communication and/or change of location of base stations) as explained at column 3, lines 19-21. Nishimori further discuses that its solution provides the calibration values by using an actual transmission signal, and that, therefore, the calibration is carried out on a real time basis during actual communication, as explained at column 1, lines 50-53.

Accordingly, Nishimori teaches away from using previously known weights to form a radiation pattern that compensates for a primary radiation pattern.

Furthermore, according to Nishimori, an amplitude/phase calibration value C is calculated as a ratio of receiver outputs A and B, when a transmitter output is applied to the receiver, as explained at column 4, line 61, to column 5, line 7. Furthermore, Nishimori describers its calibration procedure this way: "the weight multiplier circuit 2-11 multiplies the calibration value thus obtained and the amplitude/phase value of the receive signal, and the transmission is carried out by using the product of said multiplication. Thus, the calibration among the branches of an array antenna is carried out in a transmitter/receiver itself, and an excellent transmission is provided as if no

amplitude difference and no phase difference among the branches existed. Thus, according to the present invention, an amplitude and phase among branches are calibrated." Column 10, lines 40-48.

Nishimori's description of the calculation of the amplitude/phase calibration value C and the use of the amplitude/phase calibration value C in transmission evidently indicates that Nishimori does not teach the use of previously known weights, since previously known weights cannot possibly be used in the calibration procedure disclosed by Nishimori. Furthermore, Weiss does not remedy Nishimori's deficiencies, or overcome Nishimori's teachings away from the claimed invention. It is, therefore, respectfully requested that the rejection of claims 3, 32, and 51 be withdrawn.

Claims 4-24, 26-31, 33-43, 45-50, and 52-62 depend respectively from, and further limit, claims 1, 2, 25, and 44. Therefore, it is respectfully submitted that each of claims 4-24, 26-31, 33-43, 45-50, and 52-62 recites subject matter that is neither disclosed nor suggested in the combination of cited references. Thus, it is respectfully requested that the rejection of all of claims 1-62 be withdrawn.

For the reasons explained above, it is respectfully submitted that each of claims 1-63 recites subject matter that is neither disclosed nor suggested in the cited art. It is, therefore, respectfully requested that all of claims 1-63 be allowed, and that this application be passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by

telephone, the applicant's undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

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Enclosures: Request for Continued Examination
Petition for Extension of Time
Additional Claim Fee Transmittal